

# BIODIVERSITY Makes It Work

NAWMP in Alberta

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## Understanding the Decline: Is there **hope** for Alberta's Sage-grouse?

Cameron Aldridge doesn't use a crystal ball, but his combination of hard work and sound research led to eerily accurate predictions concerning the decline of Alberta's sage-grouse population. In fact, if Aldridge's last season of data represents the beginning of a longer term trend, the sage-grouse could disappear more quickly than first imagined. Over the next 20 years numbers could drop to less than 100 birds and this may not be enough to sustain a viable population.

Alberta's sage-grouse population has been declining over the last 30 years—some suggest by as much as 92%—and now consists of 300 to 400 birds inhabiting a tiny refuge, no bigger than 4,000 km<sup>2</sup>, in the southeastern part of the province. Earlier research in Alberta has suggested that the population decline is a result of low recruitment due to poor chick survival.

Aldridge has been studying habitat use and selection at nest sites, brood-rearing locations, summer loafing sites and at overwintering areas in order to better understand the importance of elements such as nesting cover and food resources to the population. In particular, a better understanding of how habitat influences sage-grouse survival at each life stage is crucial to identifying remedies for the decline. Together, all of these data are being used by Aldridge to



Sage-grouse hen on nest (photo courtesy C. Aldridge)

develop population and habitat models, eventually leading to a population viability analyses for Alberta's sage-grouse.

Using his model, Aldridge predicted that the number of male sage-grouse attending leks, or strutting grounds in the spring, would decrease from the 140 observed in 1999 to an estimate of about 113 in 2002. However, when the time came, he was only able to count 97 males on leks in 2002. Continued drought conditions may



Sage-grouse chick, two days old  
(photo courtesy C. Aldridge)

have contributed to productivity even lower than in 1999-2001, and resulted in a population smaller than predicted.

Other extreme weather events impacted the sage-grouse population. In 2002, a large mid-May snow storm and three days of continuous cold, heavy rain resulted in the lowest-ever-recorded

*Aldridge believes cattle grazing may be used as a tool to enhance sage-grouse habitat. This type of managed grazing has been successfully implemented on many Alberta NAWMP Partnership properties.*

nest success for this population: only 5 of 37 nest attempts were successful (13.5%). The poor weather resulted in at least six nests being abandoned. Females on four of these nests incubated the unviable (frozen early in incubation) eggs for 30 or more days (longer than the normal incubation period) before abandoning the nest.

With only five successful nesting attempts in 2002 and the loss of two broods within a couple of days of hatching, the lowest estimates of chick survival in the last five years were recorded (0-7%). In addition, only 17% of the sage-grouse captured by Aldridge were yearlings; down from 25% from 1998 through 2000. For a population to be stable, this number should be around 50%.

What does all this mean? Are we past the point of no-return? Aldridge doesn't think so, and let's hope this prediction rings true as well. "The shallow, ephemeral "puddles" that green-up quickly in the spring, produce a lot of forbs

and other vegetation that are important for chick feeding, along with a fair number of insects—an important source of protein for the chicks," says Aldridge. "Since recruitment of young sage-grouse is a major limiting factor, there is the potential to do some good by protecting and enhancing these important habitats across the landscape."

Specifically, Aldridge believes cattle grazing may be used as a tool to enhance sage-grouse habitat. By timing the grazing and moving cattle around, some green areas in spring can be set aside for sage-grouse brood-rearing (and for breeding waterfowl), then grazed in early summer. In addition, if range management practices can be implemented that allow for increased spring residual grass cover, nest success will increase. This type of managed grazing has been successfully implemented on many Alberta NAWMP Partnership properties, and has not only increased the production of upland nesting waterfowl, but has been proven to increase the productivity of the range as well. So, taking this approach for sage-grouse could benefit more than just these birds.

"A Sage-grouse Recovery Action Group has been put together to develop best management practices that are most beneficial to sage-grouse, and then to understand how sage-grouse respond." Aldridge continues, "We know that we're looking at providing a mixture of land-



Male sage-grouse strutting on lek  
(photo courtesy C. Aldridge)

scape types. For example, grouse display on heavily-grazed areas, nest in thicker sagebrush with good residual grass cover, and raise their chicks in more forb-rich areas. The key is involving everyone, including landowners and industry, in developing a collective and adaptive form of land management that will work to everyone's benefit."

Clearly, one of the greatest challenges facing the Recovery Action Group is in addressing the

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# A Close Look at the Aspen Parkland

The Parkland Natural Region, covering about 10% of Alberta, is the most heavily-impacted natural region in Alberta. It is located between the drier grasslands to the south and the wetter, more heavily-treed boreal areas to the north and west.

It is characterized by a climatic and topographic regime well-suited to agriculture; large and small urban areas supported by the agricultural industry dot the landscape. Today most of the native vegetation has been lost to agriculture, infrastructure and other industry. Some suggest that only about 10% remains as native land, although

Bjorge's final report on an inventory of native vegetation and wetlands for the Parkland Natural Region is due out this year. Among the many partner agencies eagerly awaiting the completion of this project are the Alberta Conservation Association, North American Waterfowl Management Plan/Ducks Unlimited Canada, Canadian Wildlife Service, Nature Conservancy of Canada, Alberta Research Council and Petroleum Technology Alliance Canada. The end product will be consist of data sets and GIS maps of the region's coniferous and deciduous trees, grass and shrubs, and wetlands. Flowing water is an additional component just now being added. The ownership of all parcels will be designated as public or private. Parcels of native parkland—what kind, where and how much—will also be identified, and these will be categorized by geographic units including watershed and municipality. All this and more for an area measuring 55,000 km<sup>2</sup>!

Bjorge describes three main uses for his data. Ongoing or new land stewardship programs will be able to quickly identify conservation priorities and whether these fall within public or private lands. Integrated conservation strategies, such as



Alberta's aspen parkland

the North American Bird Conservation Initiative (NABCI) will be able to use this information to direct the efforts of member-organizations to those priority habitat areas which overlap, multiplying the efforts of waterfowl, landbird, shorebird and waterbird conservationists. The data will also provide a base for estimating populations of various species which rely on habitat stratification. The final area of use is for research related to habitat fragmentation.

This last subject of fragmentation, or connectiveness, is an important area of research.

this number has not been quantified. The native land which does remain is very important as it is from this land and its associated wetlands that almost all the region's plant and animal biodiversity depends.

For example much of Alberta's waterfowl and white-tailed deer come from this area. Also several "threatened" species occur here including piping plover, peregrine falcon, northern leopard frog, Sprague's' pipit, and loggerhead shrike. In spite of the amount of habitat alteration that has occurred throughout the parkland, an abundance of biodiversity persists, mostly on remaining native lands.

—Ron Bjorge, Alberta Sustainable Resource Development

While Bjorge is expecting the amount of remaining native parkland to be in the neighbourhood of 10%, there are still quite a few large, native parcels on rough land and in riparian areas. These pieces, and smaller areas too, still perform ecological functions—filtering runoff, slowing wind erosion, providing biodiversity—quite adequately, and provide a great deal of beauty as well. It is important that these parcels aren't isolated; connectiveness allows them to support many additional species.

In order to keep these parcels intact and functioning, we need to know where they are, what their components are and who owns them. The results of Bjorge's project will be provided both electronically and in printed maps. These products, in turn, will provide a comprehensive basis not only for planning and implementing conservation initiatives and research, but also for guiding agricultural and industrial activity in this important landscape.

For more information, contact **Ron Bjorge** at [ron.bjorge@gov.ab.ca](mailto:ron.bjorge@gov.ab.ca)

## How Changes in Forest Cover Affect Avian Species

Just to the north and east of Bjorge's study area, Dr. Susan Hannon and her graduate students have been looking at native aspen forest cover and how its removal and fragmentation affect avian species. As one might expect, reductions in forest cover affect most bird species, but while numbers of some passerines may decline with reduced forest cover, other species, such as corvids, fare better. As Hannon says, "When humans cause change, there are always winner and loser species—it's a social call as to whether this is good or bad."

In Hannon's study area, the parkland and mid-boreal transition areas of east-central Alberta, agriculture and the development of acreages and cottages have altered the landscape. Forest cover has been removed, grassland converted to cropland, wetlands drained and forest understory



Graduate student Trisha Swift with speaker conducting a "playback" to sample birds (photo courtesy Neil Darlow)

impacted by grazing cattle. All these changes result in changes in avian species composition, with many species declining due to habitat loss.

Many studies have documented habitat change over time in the aspen parkland, but the goal of Hannon's study is to determine **when** sensitive forest species are lost from landscapes that have been fragmented by human use.

Using Landsat images, the amount and composition of forest cover and human land use across the study area were determined. The number of owls, woodpeckers, resident passerines and grouse

were identified across a gradient of landscapes representing those that were relatively undisturbed by human use to those that have been highly impacted (e.g. cropland, cattle grazing, roads). Fifty, 100-hectare landscapes ranging from 3.5 to 89% forest cover were surveyed for smaller birds and 50, 1,500-hectare landscapes were surveyed for owls. Factors that may influence reproductive success, such as food availability and predation pressure, were also identified. The intent was to pinpoint "critical thresholds" of forest cover and forest configuration for each of the species sampled.



Aspen forest cover (photo courtesy of Trisha Swift)

For example, the white-breasted nuthatch, hairy woodpecker, and common raven were absent in forest cover of 10% or less. Black-capped chickadee abundance was tied to forest cover of at least 20% while the abundance of downy woodpeckers was more sensitive to forest cover, requiring 40 to 50%. There was weak evidence for a threshold of about 30% forest cover for ruffed grouse. Red-breasted nuthatch numbers declined linearly, and this species was absent in landscapes with less than 15% forest cover. For two species, there was moderately strong evidence that reproduction declined at higher thresholds of forest cover than required for species presence. Mated pairs of white-breasted nuthatch were present in 30 to 60% forest cover while hairy woodpeckers required 40 to 60% forest cover.

Five species of owls were recorded in the study area and in two other regions chosen to measure the generality of the findings. Great-horned owls appear to have increased in abundance in one region, while numbers were steady at another. Numbers of forest-dwelling species, such as boreal and barred owls, were surprisingly low. This suggests there

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## When waterfowl compete with fish, it's waterfowl that can lose

The alteration or consolidation of wetlands by man can be detrimental to both wetland function and habitat use. When shallow wetlands are replaced with larger, deeper ones, some productivity and habitat for waterfowl are lost. But, when these changes allow the colonization of fish, the increased competition for food sources such as invertebrates puts some species of waterfowl at a serious disadvantage. After all, fish have the upper hand (fin!) when it comes to feeding on tiny aquatic organisms.

Caroline McParland has completed a three-year study in the aspen parkland that investigated the differences in invertebrate abundance and diversity in wetlands containing fish (minnows) and those with no fish.



Blue-winged teal

She then assessed whether or not these differences affected the foraging habits of the blue-winged teal and the red-necked grebe.

The blue-winged teal and red-necked grebe were chosen for this study because they are relatively common and widespread in the study area and they forage for food in very

different ways. The composition of the aquatic invertebrate communities were determined in 8 ponds with fish and 10 ponds without fish in a study area of nearly 300 km<sup>2</sup>, including both Elk Island National Park and the Blackfoot Provincial Recreation Area.

After observing and recording bird behaviour and the forage available for one field season, 4,000 brook stickleback and fathead minnows were introduced to each of two wetlands that had previously been without fish. These fish are part of the natural assemblage in the area and were taken from nearby wetlands. Bird habitat use, and the abundance and composition of invertebrates in the wetlands with fish and without fish were



Caroline McParland setting invertebrate traps (photo courtesy K. Brunnen, Elk Island National Park)

monitored in 2001 and again in 2002 to determine any longer term effects of the fish introduction.

McParland's observations showed that the presence of fish reduced the abundance of invertebrates in general, but that the effect was different for each taxon, resulting in a change in the invertebrates available for forage.

Also, when fish were added to a wetland, the number of amphipods (an important waterfowl food source) dropped almost in half and the time required for blue-winged teal to forage increased from less than 5% before the addition of fish to more than 40% after the fish were added. The foraging behaviour of the grebes didn't change. This was expected as grebes will opportunistically feed on fish.

Over the winter of 2001/2002, all the fish introduced to the wetlands winterkilled. When McParland sampled the invertebrate community again, she found that the number of amphipods did not recover, even though the fish were no longer present. Obviously, the introduction of fish had an effect on the invertebrate community that was relatively long-lasting,

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## What's good for the mallard is good for the salamander. Or is it?

Both waterfowl and amphibians depend on aquatic and terrestrial environments, but unlike the habitat needs of waterfowl in the aspen parkland of Alberta, not much is known about the specific habitat requirements of amphibians in this area. Sara Eaves is looking to change all this by studying the connection between amphibian abundance and distribution, and the intensity of land-use on both the local and landscape level.

For most biologists, and even many lay people, it's reasonable to conclude that the more heavily disturbed landscapes, such as cropland and pastures, would support fewer amphibians than would relatively undisturbed landscapes. So, it was a bit of a surprise when Eaves found the tiger salamanders captured during her study were most abundant at wetlands within grazed and cropped fields. Eaves suspects that this may be due to the greater density of small mammal burrows in these landscapes where adult tiger salamanders are known to spend much of their time when not breeding. Another explanation may be that these wetlands are more exposed, warmer and more productive,



Tiger salamander

and therefore provide something the salamanders need. At any rate, these more disturbed landscapes are providing suitable habitat for the salamanders. Eaves is hoping to find out more as she continues to analyze her data.

The other four species of amphibians found within Eaves' study area were the wood frog, chorus frog, Canadian toad and western (boreal) toad. In all, 213 sites were monitored, each categorized as one of four land-use types. Call surveys (at all 213 ponds), and both pitfall and minnow traps (at 24 sites), were used to determine the presence, abundance and diversity of amphibian assemblages at each site. As well, habitat features from the local and the landscape level were recorded. This included the physical, chemical and biological conditions of the wetland and major landscape features, such as the presence of roads and patches of forest, within a 1 km radius of the wetland. Results from both the call surveys and intensive trapping indicated that the abundance of both wood frogs and chorus frogs increased as the intensity of land-use disturbance decreased (i.e. from crop to pasture to residential to relatively undisturbed).

While Eaves analyzes her data to find links between habitat features and amphibian distribution and abundance, she will be keeping an eye out for anything that may be used to explain the expansion of the western toad's range eastward, apparently at the expense of the Canadian toad. The range of the Canadian toad has included the eastern half of Alberta, Saskatchewan and Manitoba, while the western toad ranged west of this. Previous work in Eaves' study area confirmed this distribution. However, in both 2001 and 2002, Eaves found "tons" of western toads at sites where none had been previously recorded. At the same time, the Canadian toad seemed to be disappearing, and wasn't as common a sighting as in recent years. The status of both the Canadian and western toads bears monitoring—the Canadian toad may be at risk while the western toad is listed as sensitive—so any information Eaves is able to provide on their numbers and distribution will be helpful.

It has only been recently that researches have begun to consider the importance of habitat features on a larger spatial scale to amphibians. For example, we do not know to what extent amphibians rely on forest patches near wetlands for migration and hibernation. The final results of Eaves' study should shed some light on this topic. She'll also be able to provide evidence on the effectiveness of different amphibian survey techniques. What's more, Eaves will be providing the Alberta NAWMP Partnership with more information to guide the management of its projects for the benefit of multiple species.

For more information, contact **Sara Eaves** at [seaves@ualberta.ca](mailto:seaves@ualberta.ca)



Amphibian pitfall traps at pond in pasture (photo courtesy S. Eaves)

More on

## Understanding the Decline: Is there hope for Alberta's Sage-grouse?



Weighing sage-grouse chick  
(photo courtesy C Aldridge)

cumulative effects of many habitat pressures over time. The growth of industry and agriculture within the sage-grouse's range and the persistent drought through the last couple of decades have left their marks. With any population at low numbers, disastrous weather conditions such as those experienced during the spring of 2002, can have large impacts on population numbers. Even seemingly innocuous power lines can, unfortunately, play a deadly role, as sage-grouse are killed flying into the lines and

raptors use the poles as perches to prey on the grouse.

Sage-grouse in Alberta are at the northern extent of their range, and it is possible that connectivity to the core population in Montana has been cut off by intensive cultivation to the south. Aldridge hypothesizes, "Habitat in Alberta is marginal compared to that of the core populations to the south. If the Alberta population was always supplemented from populations in Montana, and this route has now been cut off, there is the possibility that with Alberta's small numbers of sage-grouse, inbreeding could be a problem."

Aldridge has initiated a genetics project with Krissy Bush, a graduate student at the University of Alberta, to address the consequences of potential inbreeding. Bush's initial work has shown that some chicks are experiencing developmental problems, such as having no eyes. This could be the result of some form of toxicity in the environment or malformations due to inbreeding.



Sage-grouse hen with radio-collar  
(photo courtesy C. Aldridge)

Ultimately, Aldridge's population modelling will not only provide information on the habitat required to sustain the Alberta sage-grouse population, as well as management suggestions on how to get there, but also information on the number of sage-grouse required to maintain genetic diversity, and therefore maintain this species' ability to adapt to changing environmental conditions.

For more information on this study, contact **Cameron Aldridge** at [aldridge@ualberta.ca](mailto:aldridge@ualberta.ca).

More on

## How Changes in Forest Cover Affect Avian Species

may be considerable variation in how species of owls respond to habitat availability and configuration across landscapes. No critical thresholds for owls were identified, or perhaps the time frame of this study was not sufficient to detect these thresholds.

Hannon's study was conducted over an area of approximately 2,500 km<sup>2</sup> of aspen parkland that ranged from Elk Island National Park in the north, Ministik Lake Game Bird Sanctuary and Miquelon Lake Park in the south, and stretching west from Beaverhill Lake to Cooking Lake. To date, most land use change in this area has been the result of urban expansion and the conversion of forest cover to range land.

This study area corresponds to a high-priority landscape for the Alberta NAWMP Partnership and the study findings should assist in habitat management decisions.

With further analysis, this study should also help construct an index of biological integrity indicating when human use of landscapes results in the loss of biodiversity. If or how this index will be applied to the real world is not yet certain. When asked how large a piece of aspen

forest must be maintained to retain the most biodiversity, Hannon responded, "Woodlots of 100 hectares would contain most passerines and grouse, but much larger patches would be required for larger species such as raptors." She added, "Smaller woodlots, woodlots that have had spruce removed or harvested, and woodlots that have had cattle access all support less biodiversity. Narrower strips of forest, 100 metres wide or less, are prone to "edge effects," meaning that corvids (magpies and crows) can more easily penetrate the cover and prey on smaller species."



Black-capped chickadee  
(photo courtesy Trisha Swift)

The next obvious question is, do we have sufficient numbers of large aspen forest patches left in agricultural areas to maintain biodiversity? "At present, in our study area, we have Elk Island Park and the Ministik Lake Game Bird Sanctuary which are quite large. These areas must be protected from urban and agricultural expansion. Whether this will be enough over the long-term is hard to predict," says Hannon.

For more information, contact **Dr. Susan Hannon** at [sue.hannon@ualberta.ca](mailto:sue.hannon@ualberta.ca)

## More on When waterfowl compete with fish, it's waterfowl that can lose

altering the composition of that community to the detriment of at least one species of waterfowl, the blue-winged teal.

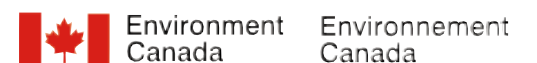
Fish colonization of parkland ponds is a natural phenomenon, particularly when wet and dry climate cycles alternate. Although the presence of fish introduces a new source of food for some species of waterfowl, even small minnows can out-compete species such as the blue-winged teal for important, protein-rich prey items. Man-made wetland consolidation that leads to fish colonization creates large, isolated wetlands and removes important small wetland habitats from the landscape. McParland suggests that in order to manage and maintain prime waterfowl habitats, particularly given the increasing drought conditions in the parkland, managers in agencies such as the Alberta NAWMP Partnership, may wish to discourage wetland consolidation and changes in wetland connectivity that promote the colonization of fish, possibly by developing programs whereby landowners are given some incentive to avoid the practice.



Amphipod

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### Alberta NAWMP Partners



and U.S. Partners including  
The North American  
Wetland Conservation Act

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